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**THREE VIEW LANGUAGE:  
A GRAPHICS-BASED LANGUAGE FOR  
REQUIREMENTS DEFINITION**

**SPC-92114-CMC**

**VERSION 01.00.00**

**MARCH 1993**

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# **THREE VIEW LANGUAGE: A GRAPHICS-BASED LANGUAGE FOR REQUIREMENTS DEFINITION**

**SPC-92114-CMC**

**VERSION 01.00.00**

**MARCH 1993**

**Dr. Paul Ward**

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This document accompanies a videotape of the same presentation recorded live at the Software Productivity Consortium in February 1992. It is recommended that the videotape be viewed with these viewgraphs at hand.

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# **SOFTWARE DEVELOPMENT CONCEPTS**

Date: December 17, 1992

TO: SOFTWARE PRODUCTIVITY CONSORTIUM  
2214 Rock Hill Road  
Herndon, VA 22070

ATTN: Technology Transfer Clearinghouse

This letter is in reference to a talk given on July 27, 1992, by Paul T. Ward at the Software Productivity Consortium ("SPC"), on the subject of "3VL: A Formal Description of a Graphics-based, Three-view Operational Specification Language".

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The paper copies of the presentation material must be marked with our Copyright Notice.

Questions regarding 3VL can be directed to the developer, Paul T. Ward, care of Software Development Concepts (contact info below).

Yours Truly,



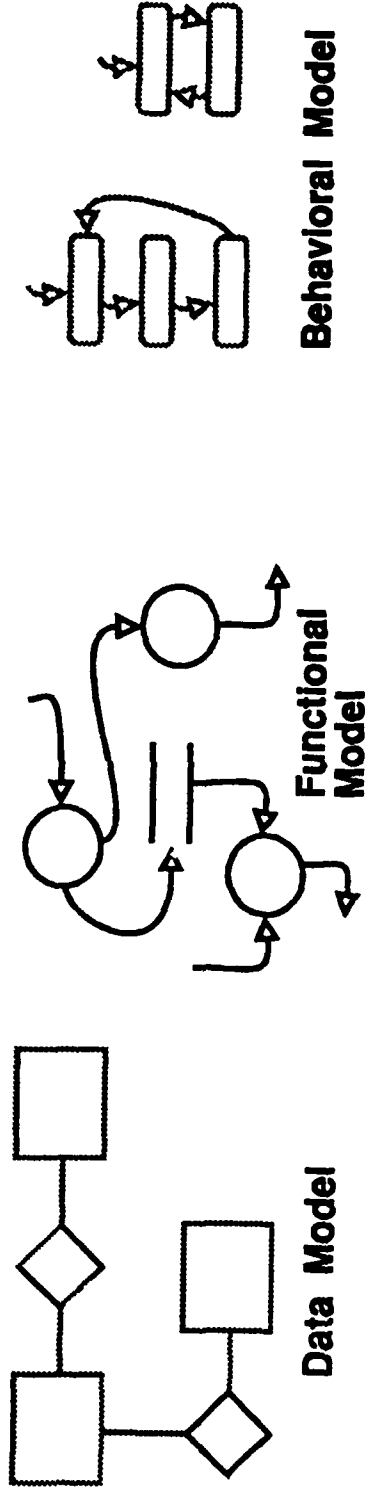
Pamela M. Plate  
Managing Partner

# **3VL: A Graphics-Based Language for Requirements Definition**

**Paul T. Ward**

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Software Development Concepts  
185 West End Avenue, Suite 27-L  
New York, NY 10023  
Phone 212-362-1391**

**Many developers use combinations of notations to build models representing various *views* of the requirements for a software system.**



**These models are often verified by *execution*.**

**Since the mid-1980s:**

- **Formal execution rules (operational semantics) have been defined for some of these notations.**
- **A few CASE tools (notably Statemate) have provided for automated execution of graphics-based requirements definition models.**

**However, there are still barriers to building comprehensive, executable, graphics-based requirements definition models:**

- **Existing execution rules for functional (data flow) notations are superficial.**
- **There are no execution rules for data modeling (entity-relationship) notations.**
- **There is no provision for dynamic instantiation.**

**3VL is an extension of the Harel statechart-activity chart notation which provides:**

- **A comprehensive operational semantics encompassing the data, functional, and behavioral views**
- **dynamic creation and deletion of objects**

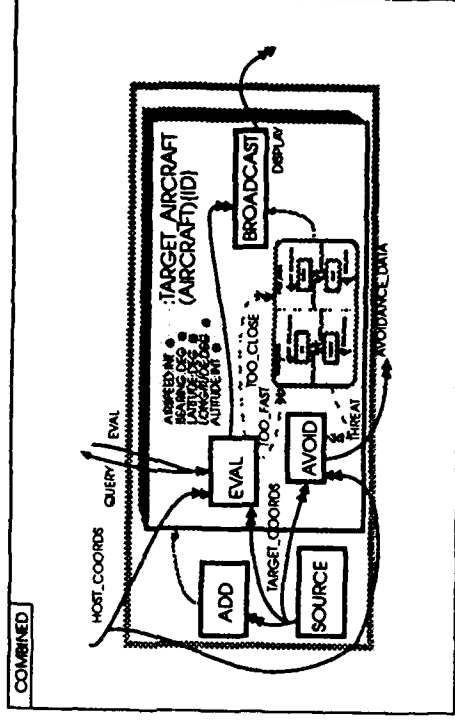
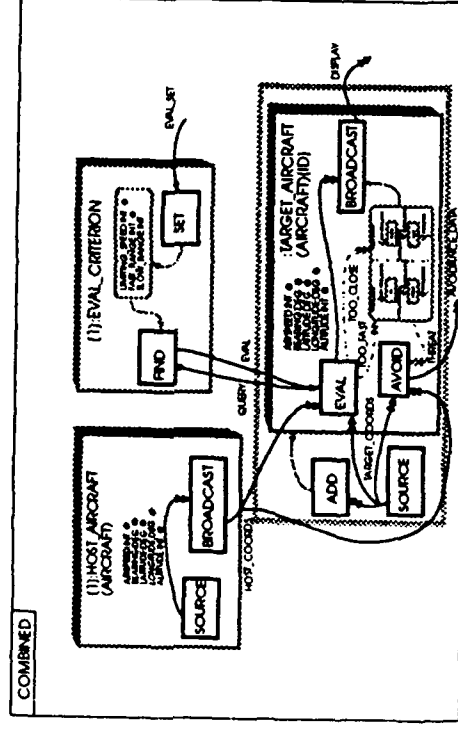


**3VL is also designed explicitly for use on an interactive electronic display medium; extensive use is made of colors and textures to aid comprehension.**

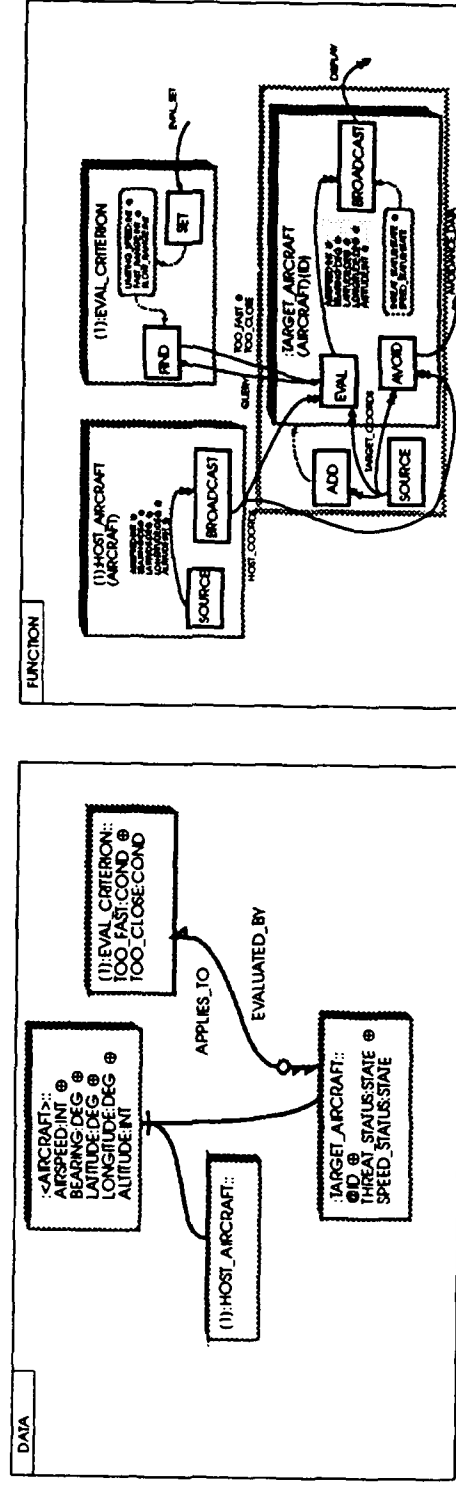
**3VL reduces the number of diagrams required to build a model by providing:**

- unlimited nesting within a single diagram**
- a layered notation from which views are obtained by selective suppression of details**

Unlimited nesting allows various levels of detail to be obtained from a single diagram by panning and zooming.



**A layered notation permits a single diagram to have several subsets, each similar in form to diagrams created using conventional notations.**

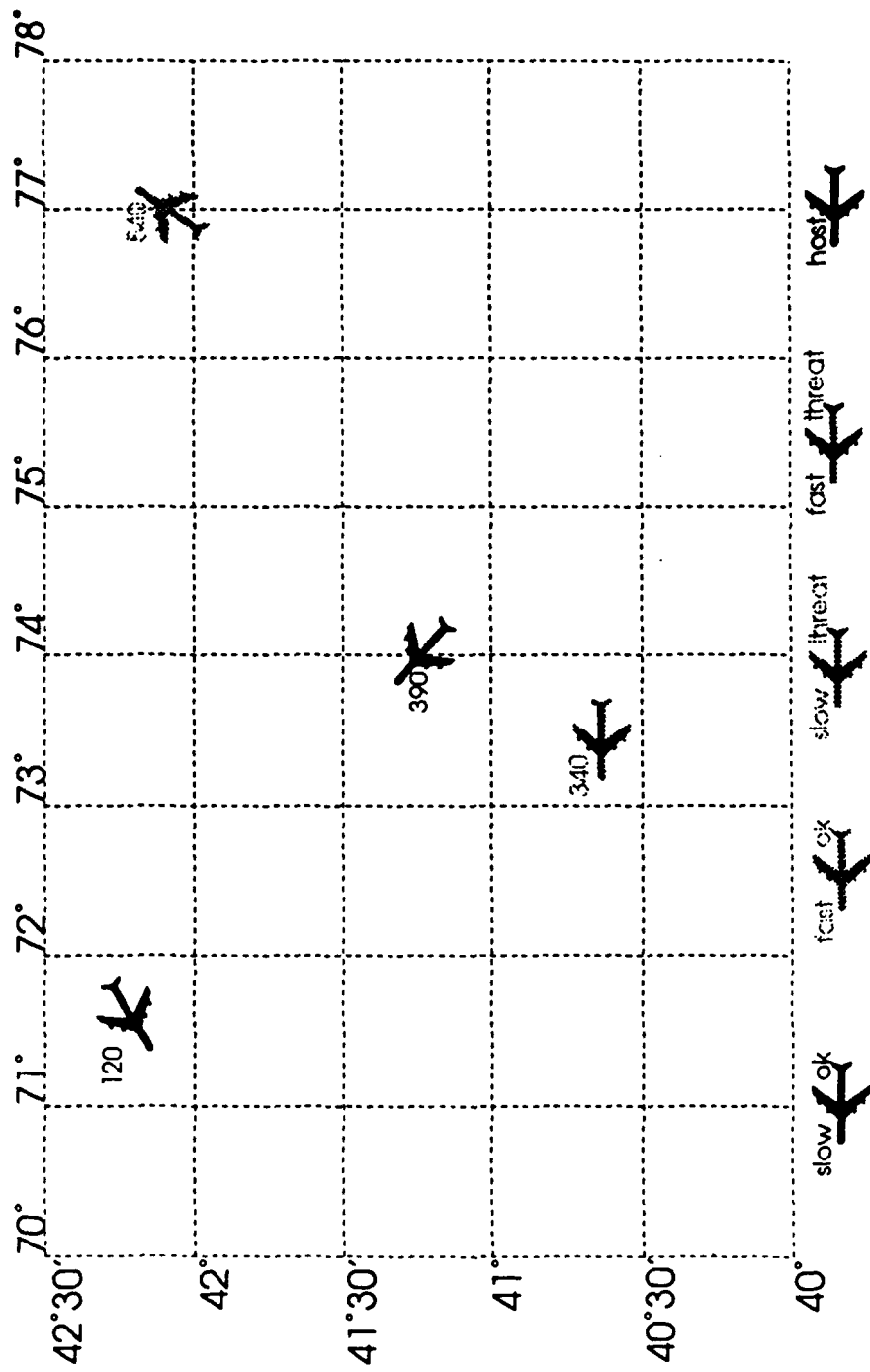


## **SAMPLE PROBLEM**

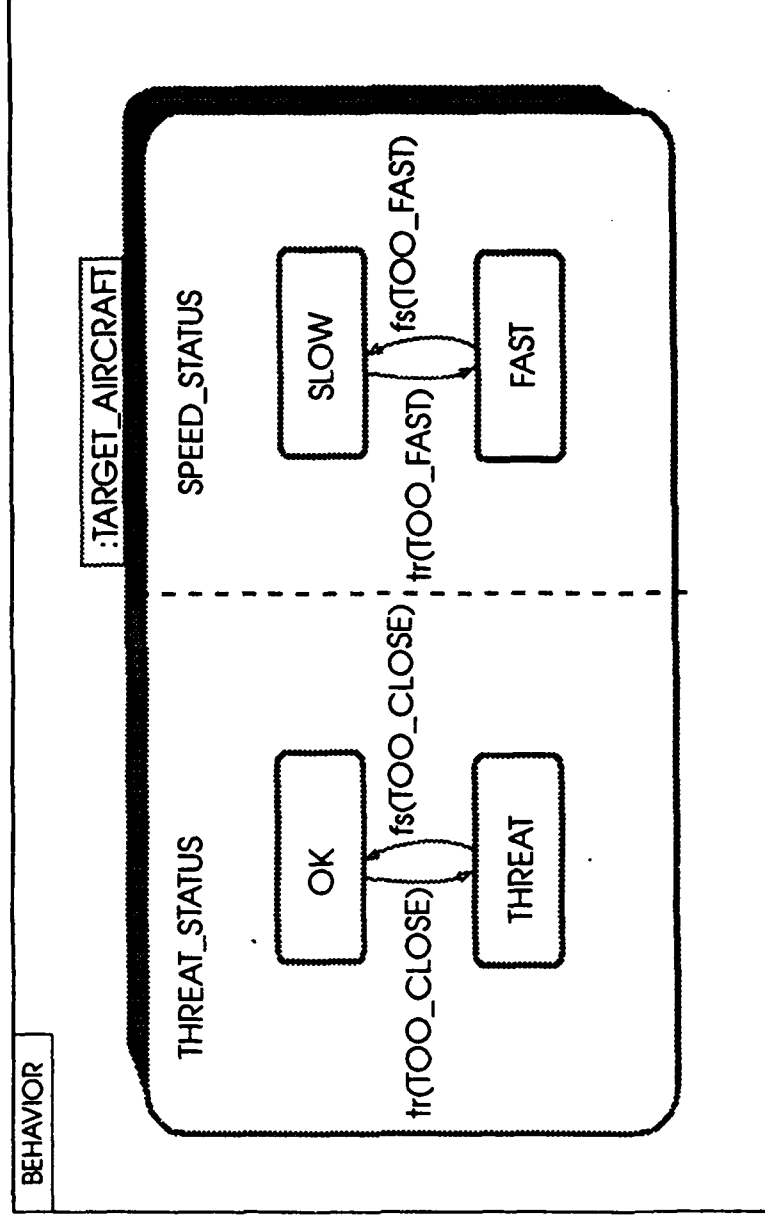
**A Collision Warning system tracks the coordinates of a host aircraft and of target aircraft in its vicinity, displaying these coordinates and also the threat (if any) posed by the target aircraft.**

**Coordinates of a target aircraft that poses a threat are sent to a collision avoidance system.**

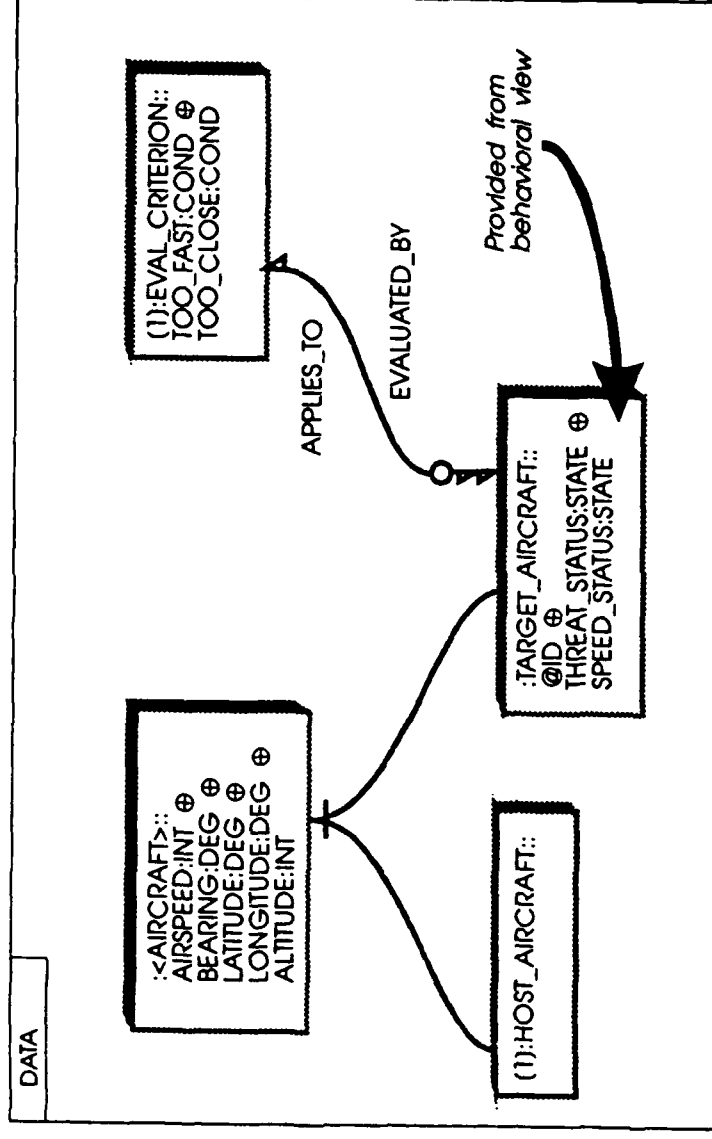
**Parameters for threat determination may be adjusted dynamically.**



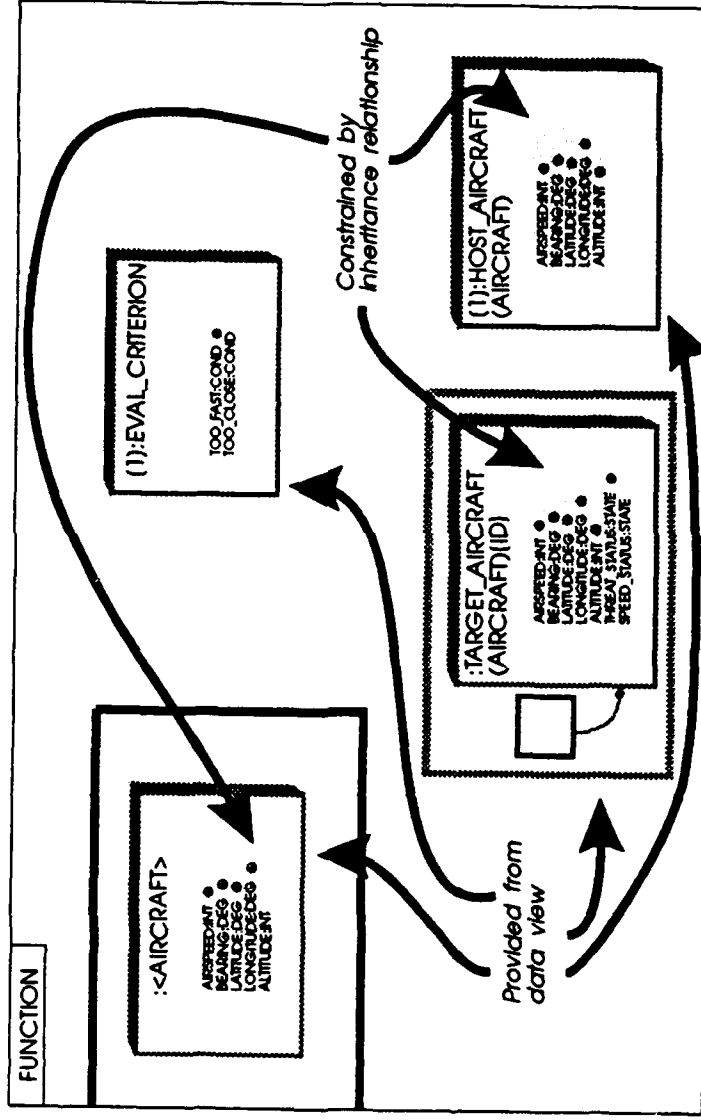
Statechart notation is used for the behavior view.



Entity-relationship notation is used for the data view.

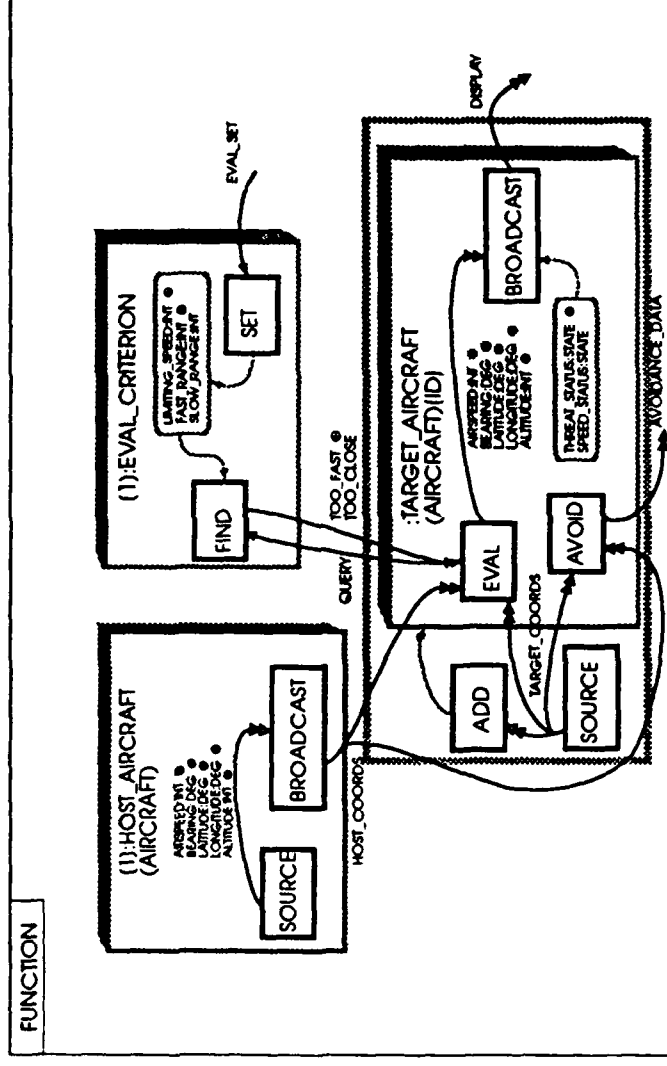


## Activity charts are used for the functional view.

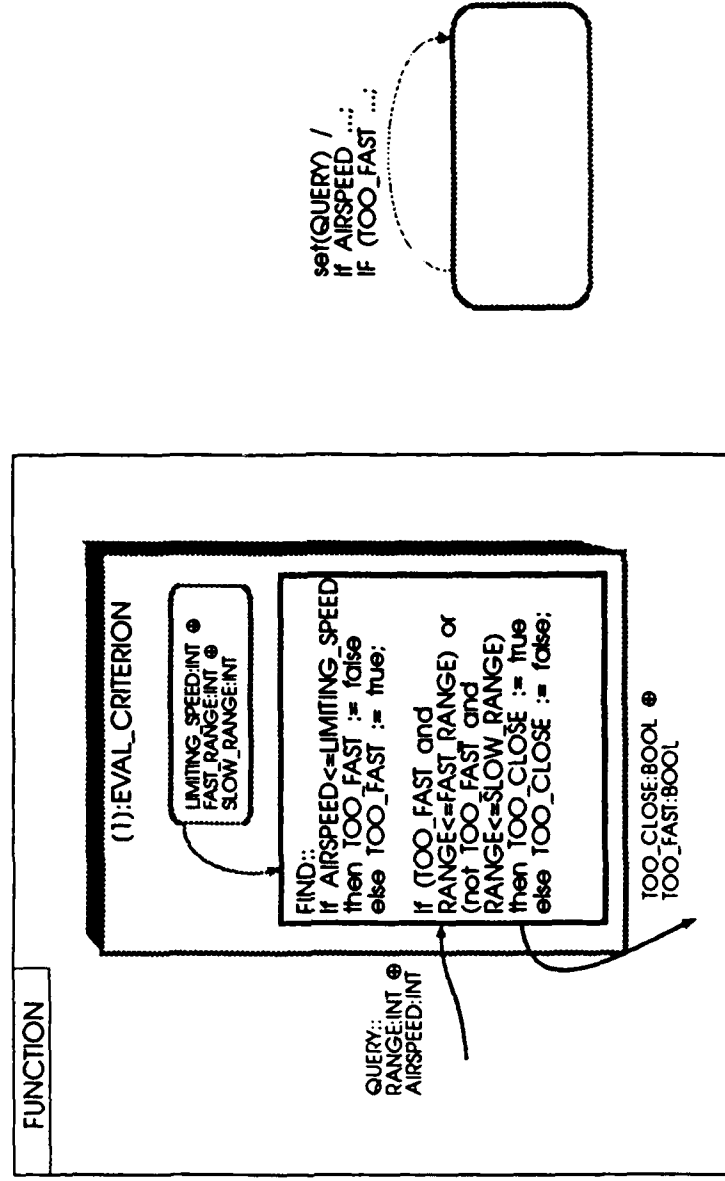




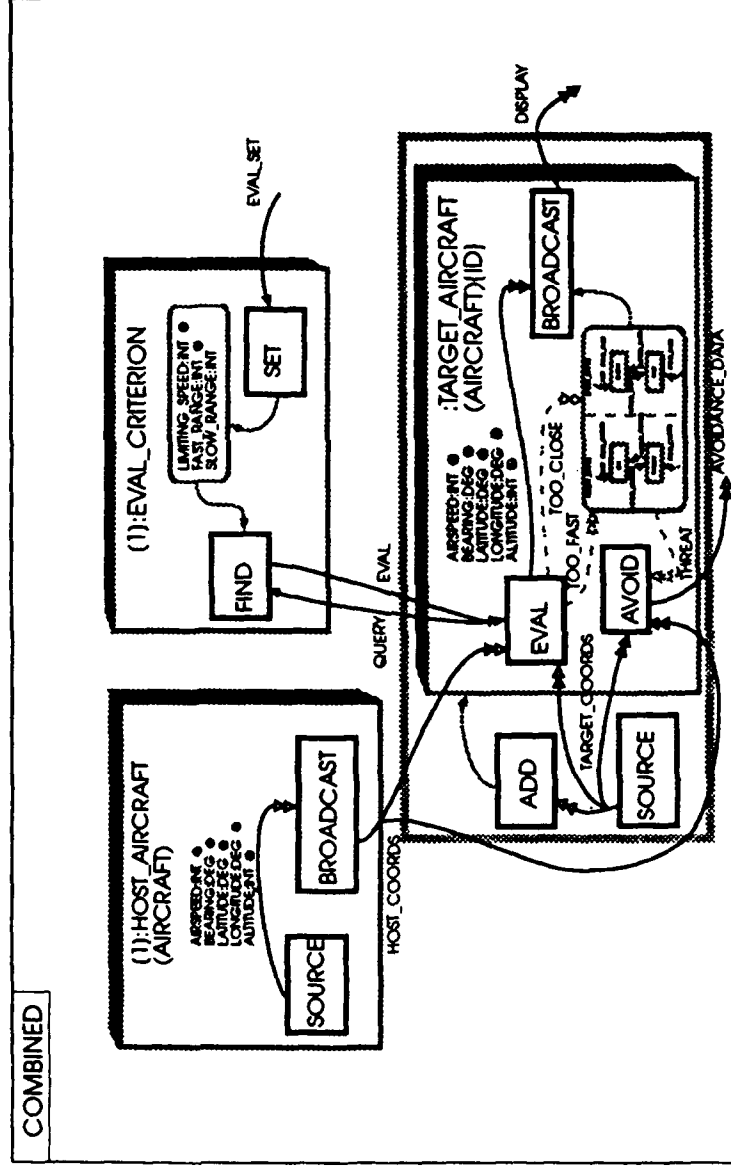
**Lowest-level activities are functions from inputs to outputs; they have no internal state.**



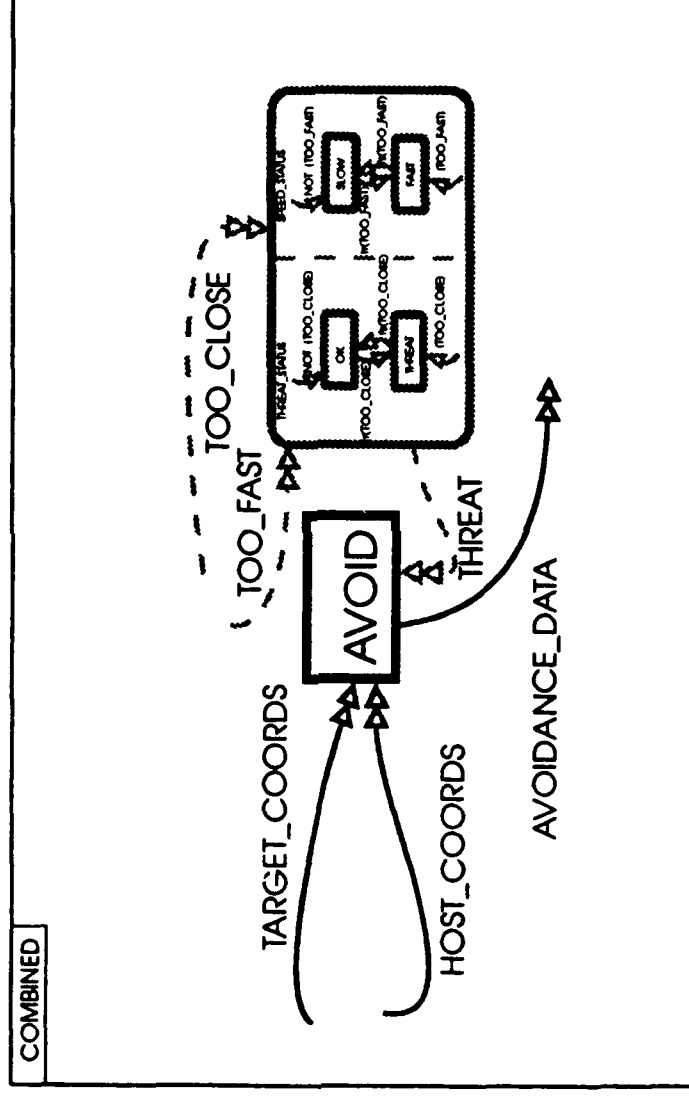
The definition of an activity is equivalent to a statechart transition expression.



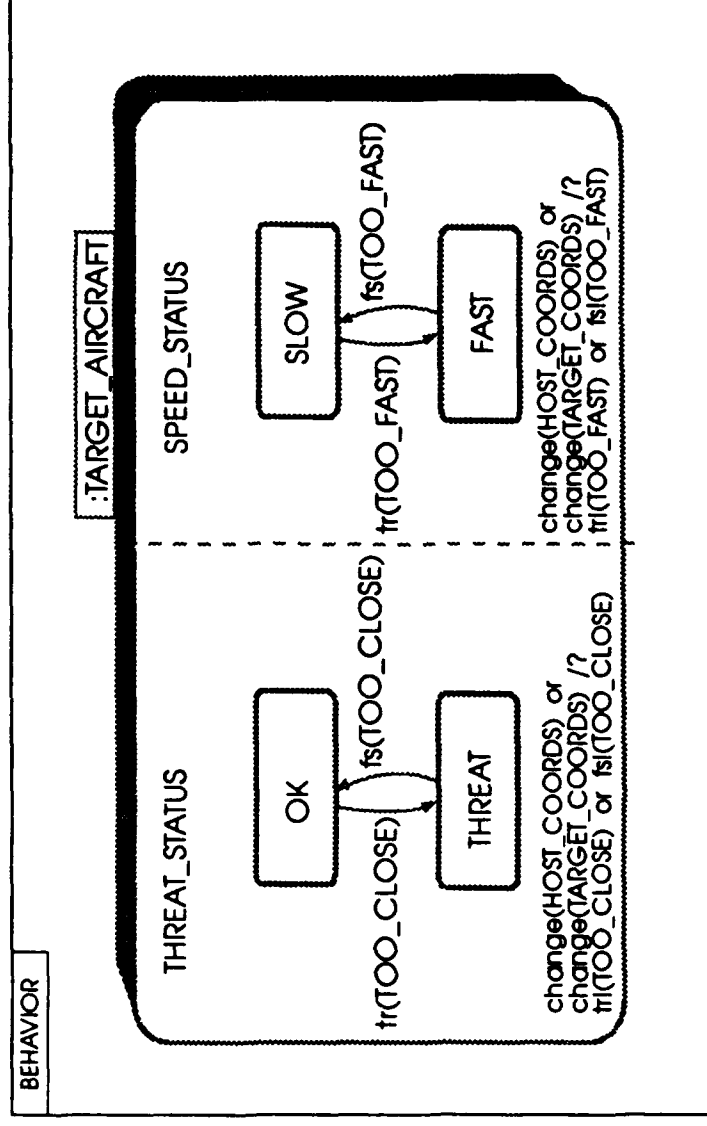
The 3 notations are layered into a combined view.



# Control of activities by statecharts is shown by labeled flow connections.



**In data and behavior views, details of functional connections are replaced by *assertions*.**



## **WORK IN PROGRESS**

- ☐ recording, browsing, and reuse of class definitions
- ☐ Construction of units representing sets of 3VL programs, and extraction of legal programs from these units
- ☐ translating 3VL requirements models into design models

***Questions or comments on content should be directed to:***

**Dr. Paul T. Ward  
Software Development Concepts  
185 West End Avenue, Suite 27-L  
New York, NY 10023  
(212) 362-1391**

***Or to:***

**Dr. Stuart Faulk  
Software Productivity Consortium  
2214 Rock Hill Road  
Herndon, VA 22070  
(703) 742-7117**

***Send feedback on the Consortium's Video Program and  
orders for video products to:***

**Technology Transfer Clearinghouse  
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Herndon, VA 22070  
(703) 742-7211**